DEPARTMENT OF **EARTH AND ENVIRONMENTAL SCIENCES**
KU Leuven - BELGIUM

The impact of the African Great Lakes on the regional climate

in a dynamically downscaled CORDEX simulation (COSMO-CLM)

W. Thiery[1], E. Davin[2], H.-J. Panitz[3], S. Lhermitte[1], M. Demuzere[1], N.P.M. van Lipzig[1]

[1] *EES, University of Leuven, Belgium, wim.thiery@ees.kuleuven.be*
[2] *IACETH, Swiss Federal Institute of Technology, Switzerland*
[3] *IMK-TRO, Karlsruhe Institute of Technology, Germany*

My website:

1. Motivation

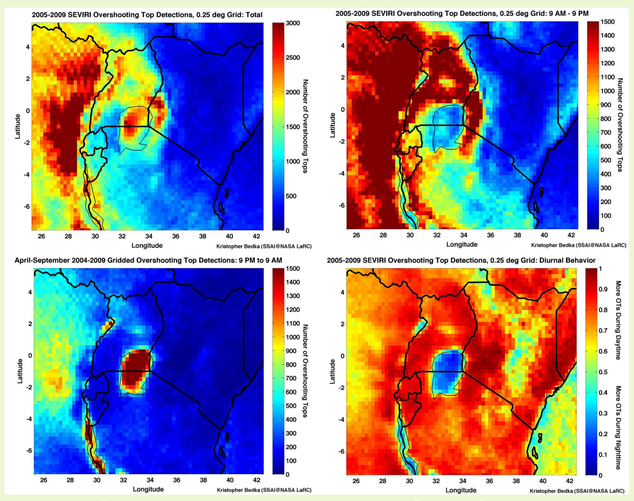

Figure 1. SEVIRI Overshooting top detections (Bedka, pers. comm.).

- severe night-time thunder-storms pose a serious tread to local fishing communities
- 5000 casualties per year estimated by local policy makers

Figure 2. Traditional fishing in Lake Kivu.

2. Setup

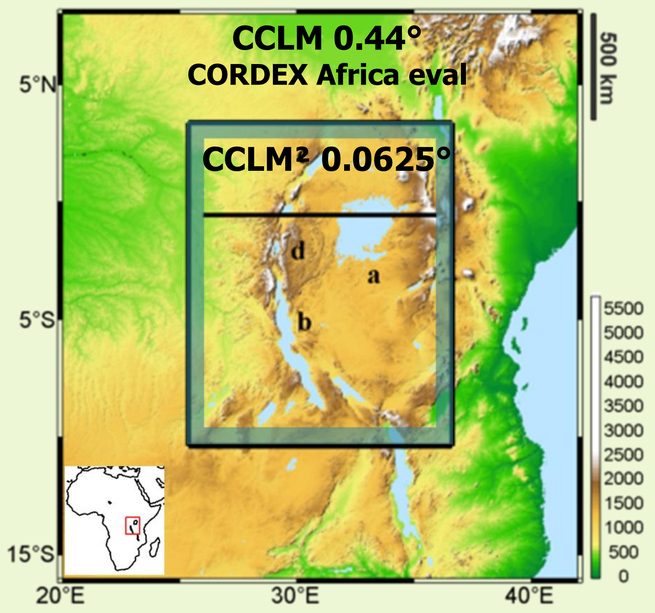

Figure 3. Nesting strategy.

- 1996-2008
- 3 years spin-up
- Evaluation simulation
- nolakes: each lake pixel replaced by a random land pixel within 50 km radius

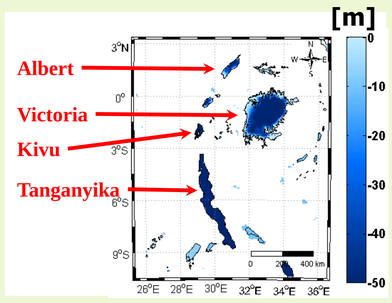

Figure 4. FLake bathymetry.

3. Model performance

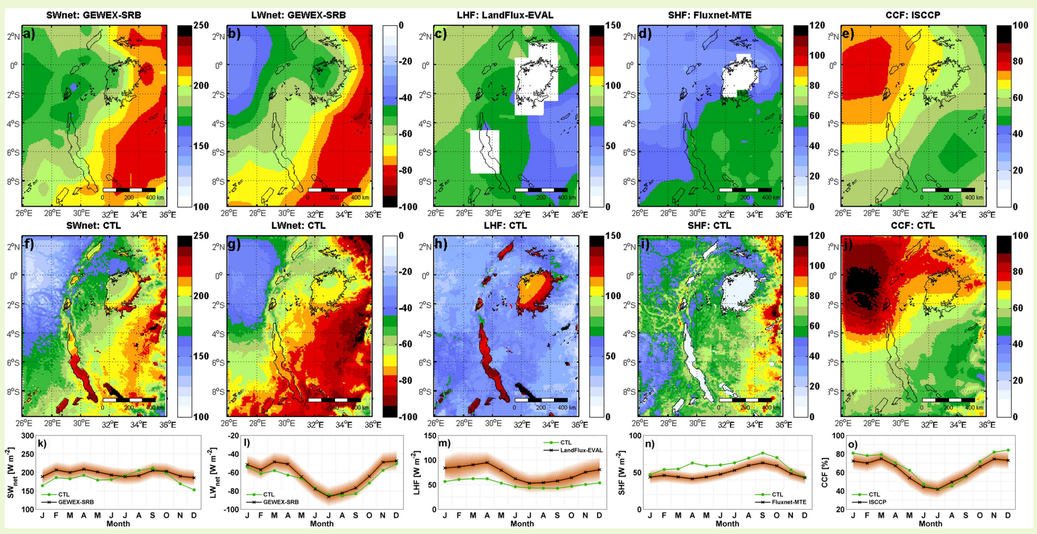

Figure 5. Surface energy balance and cloud cover evaluation

- the mean annual cycles of net shortwave and longwave surface radiation, sensible and latent heat flux and cloud cover are mostly simulated within the margins of observational uncertainty (Fig. 5).
- the model reproduces the most important spatial lake surface temperature patterns, including absolute values and gradients within and between lakes, but the amplitude of the seasonal cycle is overestimated.

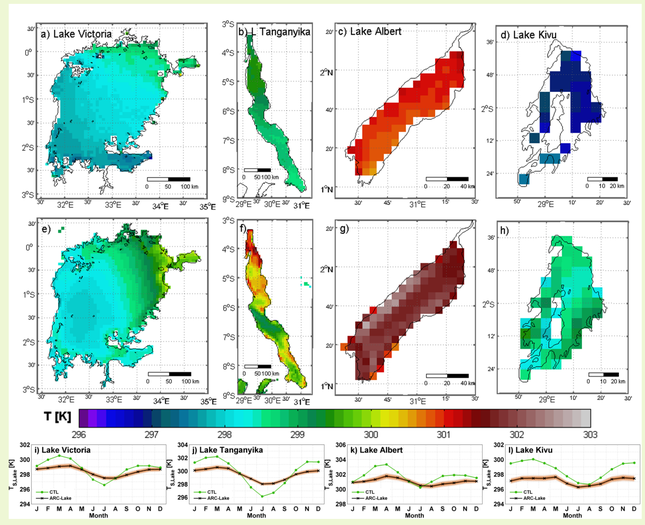

Figure 6. Lake surface temperature evaluation

4. Impact and dynamical response

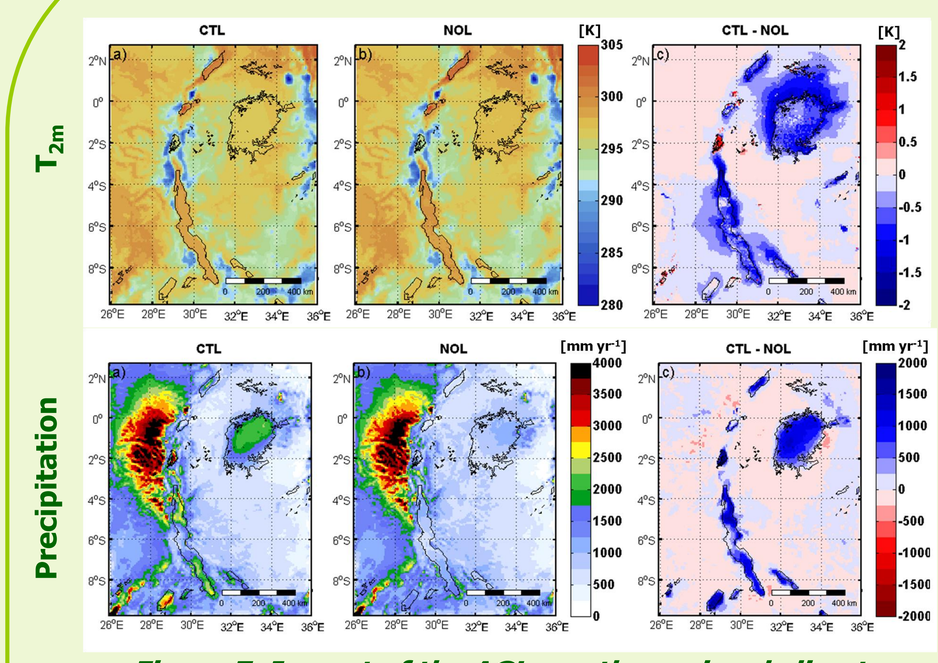

Figure 7. Impact of the AGLs on the regional climate.

- the AGL signicantly reduce offshore near-surface air temperature by about -0.57K. The cooling effect is advected across the lake shores within dynamic and orographic constraints (Fig. 7), and is found to be strongest at the end of the main dry season.
- the four major AGL enhance precipitation by +732 mm yr^{-1} (+87%) over their surface (Fig. 7). In contrast to the near-surface temperature impact, the precipitation change is highly restricted to the lake areas.

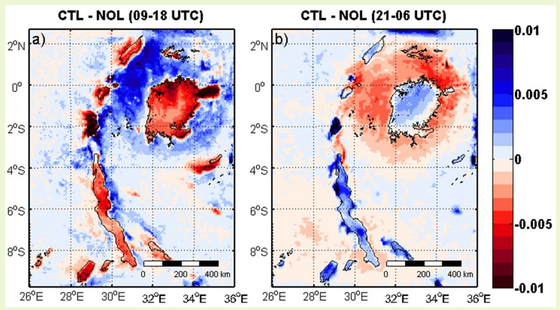

Figure 8. Evidence of strong diurnal pattern

- during daytime, the lake breeze transports cold air across the lake borders and generates over-land updrafts and over-lake subsidence, effectively suppressing convection from the unstable surface layer (Fig. 8a, 9).
- at night, the thermal inertia of the lake surface generates a positive temperature anomaly and a pressure deficit, and maintains the daytime evaporation rates, inputting large amounts of moisture into the boundary layer (Fig. 8b, 10).

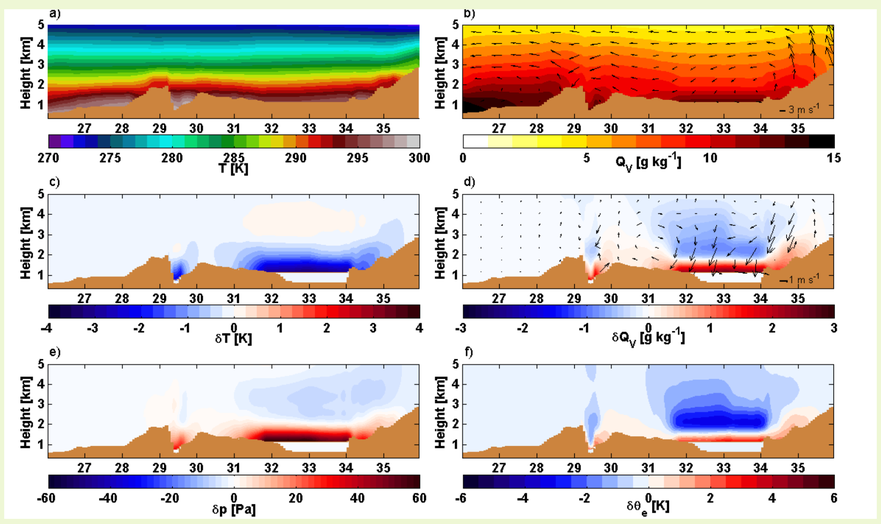

Figure 9.Daytime dynamical response

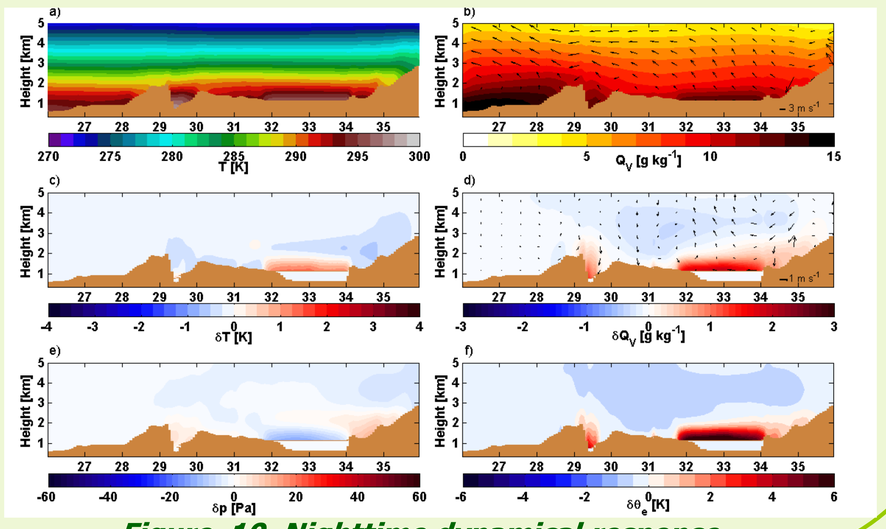

Figure 10. Nighttime dynamical response